Patisserie *Cheers!*

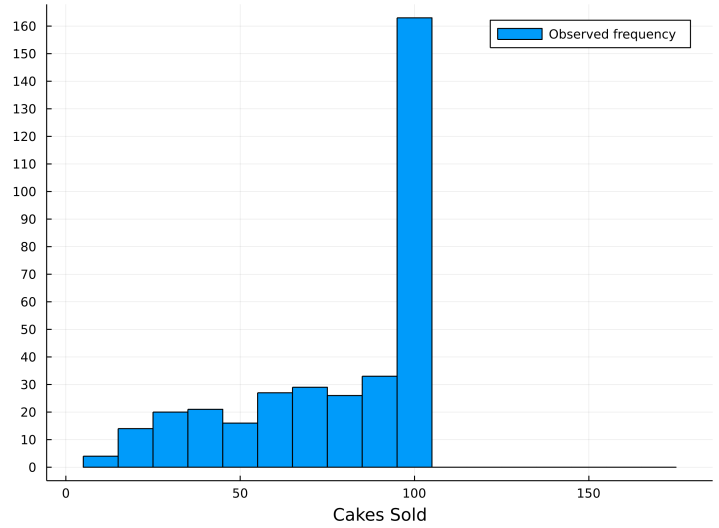
A few years ago, Kay and Lucilla established their patisserie Cheers! and this year's season has started out well. However, they still can't agree on how to deal with a serious problem they've been facing since the very beginning: how many cakes to produce each day.

The cakes they make are of the highest quality and thus come at a high price, both for them as producers, and also for their customers, who pay $ 5 for each artisanal mini cake that Cheers! produces. But their customers appear content with this price, as they tend to keep coming back for more. Multiple regular clients have said their prices are justified given the quality of ingredients, the freshness of the cakes, and the service that Kay and Lucilla provide.

After a long day with very few customers, Kay still had some work to do: Recently, they signed up for a service that organizes the donation of leftover food to people in need. She put the 28 cakes that were left over from that day into a box and waited for the courier to come pick it up.

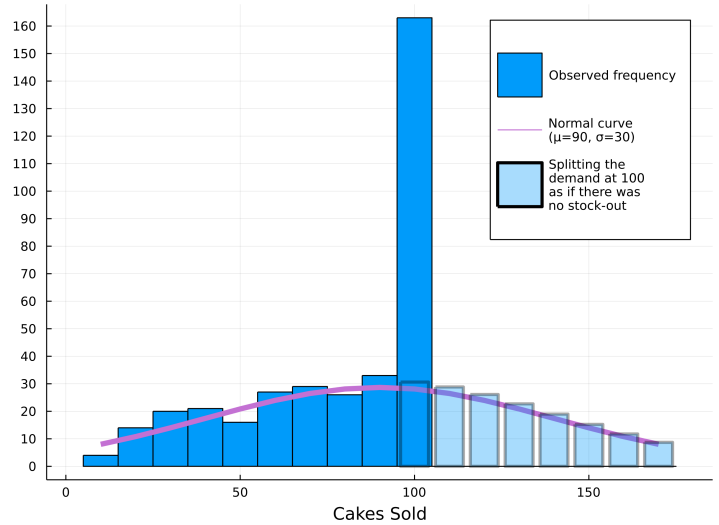
While waiting, Kay and Lucilla fell into their familiar argument about how many cakes they should be producing each day. Lucilla stressed that the excess they're donating today aren't such a big loss, given that they only cost $ 1 each to produce. But Kay hated that they worked so hard to produce these cakes and then saw nothing in return. Lucilla countered that they often have days where they have to turn customers away because they sell out.

Kay was motivated to discuss the issue again. Waiting for the courier, she scrambled up the sales data from the past year. Even though they sell out almost every other day (they prepared 100 cakes each day), the fluctuation of customers was a serious problem and let to a lot of leftover cakes. Putting the sales data into a histogram made this very clear.



At first she was confused about the shape. But it became clear that sales were between 95 and 105 cakes on 163 days last year because it contains all the many days when they sold out. On the other days, the had cakes left over.

Kay was convinced that extending the graph would make this demand looks like a bell curve, originating from a normal distribution. She was not only an excellent creator of mini cakes but also a very creative solver of problems and she googled right away on how to plot a bell curve in Excel. Moving it above the histogram, the combined picture looked best with the mean parameter $\mu = 90$ and the standard deviation parameter $\sigma = 30$.



So according to Kay's analysis, the most likely demand is at 90. Why were they making 100 cakes each day? Lucilla had a different take on the analysis. According to that bell curve, demand is between 60 and 120 on 68% of the days. She then argued that if only they produced enough, they could even sell perhaps 150 cakes on some days.

Simulation Outlook

In the simulation, you will make quantity decisions for the two ladies. The simulation will run for 30 days.

Your Task

At the begining of each day, you have to make one decision:

> 👉 **How many cakes you do you want to make for this day?**

Note that you can only make this decision once per day. **Baking further cakes during the day is not possible**.

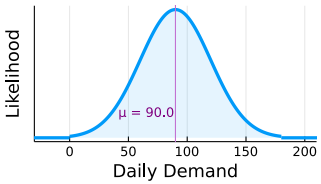
Your Goal

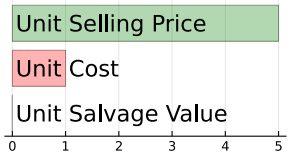
Cakes that are produces and demanded throughout the dy will be sold. Cakes that are not demanded will be discarded. You incur the cost of all cakes that you make (including those that remain unsold) but receive only revenue for the cakes sold.

☝ It is your goal to **maximize your profit contribution of the cakes.**

The Data In Brief

- You **pay $1** for each unit that you stock.
- You **get $5** for each unit that you sell to your customer.
- Customer **demand is uncertain** and will be **between 0 and 180** every day.
- Independent of the demand of the previous day, you **expect μ = 90.0** and face uncertainty captured by a standard deviation of **σ = 30.0**. The distribution is shown in the figure to the right).
- At the end of each round, unsold units are discarded at a **salvage value** of **$0**.
- The simulation lasts for **30 rounds**.





Clarifying Questions

Question 1.

a
b
c

How often do you make cakes?

a) Once per month

b) Multiple times during the day whenever needed

c) One time per day in the morning before you open the shop

Question 2.

a
b

Suppose you have some cakes leftover at the end of a day. What happens to those cakes?

a) We donate them

c) We sell them the next day at a discounted price

Question 3.

a
b

Given your demand information, you are 95% confident that daily demand will be roughly between...

a) 90 +/- 2*30, i.e., between 30 and 150

b) 90 +/- 30, i.e., between 60 and 120

Question 4.

a
b
c
d

The selling price and the unit cost of a cake are ...

a) $5.00 and $1.00

b) $1.00 and $5.00

c) $1.00 and $4.00

d) $4.00 and $1.00

Question 5.

a
b

If you make 100 cakes on a specific day and customers demand 40 cakes, then you have 60 cakes leftover and your contribution to profit on that day is...

a) 40 × $5 - 100 × $1 = $100

b) 40 × ($5 - $1) - 100 × $1 = $60

In case you struggel with question 3, please watch the video this video explaining the 68-95-97.5 rule: **https://www.youtube.com/watch?v=mtbJbDwqWLE**.